Amendments T The Claims

Claim 1 (Currently Amended): A method of monitoring drying of a relatively large volume batch of an agricultural porous media wherein the porous media is selected from the set comprising grain and seed, whether or not separated from a carrier or other vegetative structure, ~~such as a mass or collection of grain or seed~~ comprising:

(a) deriving a moisture content in the batch of the porous media by time domain reflectometry;

(b) utilizing the value to monitor drying of the porous media and in control of artificial drying process of the batch.

Claim 2 (Original): The method of claim 1 further comprising monitoring drying rate of the media.

Claim 3 (Original): The method of claim 1 further comprising monitoring moisture content of the media and comparing moisture content to an end point moisture content.

Claim 4 (Original): The method of claim 3 further comprising generating a signal when the end point moisture content is reached.

Claim 5 (Cancelled).

Claim 6 (Currently Amended): The method of claim ~~5~~ 1 wherein the porous media is seed.

Claim 7 (Original): The method of claim 6 wherein the seed is corn.

Claim 8 (Original): The method of claim 7 wherein the corn is ear corn.

Claim 9 (Original): The method of claim 7 wherein the corn is shelled corn.

Claim 10 (Original): The method of claim 6 wherein the seed is sunflower seed.

Claim 11 (Cancelled).

Claim 12 (Original): The method of claim 1 further comprising deriving moisture content at a plurality of locations in the porous media.

Claim 13 (Original): The method of claim 12 wherein the plurality of locations are at different vertical heights.

Claim 14 (Original): The method of claim 12 further comprising utilizing the derived moisture contents to control an artificial drying process.

Claim 15 (Original): The method of claim 1 wherein the step of deriving moisture content comprising obtaining a TDR measurement via a probe at least substantially surrounded by the porous media and comparing the TDR measurement to a calibration data set.

Claim 16 (Original): The method of claim 1 further comprising positioning an electrically conducting probe of a length L in the bin so that the porous media at least substantially surrounds the probe; creating an impedance mismatch at the point of electrical connection of the probe to a cable; sending a step function voltage pulse through the cable, the impedance mismatch, and the probe; measuring the reflection of the pulse.

Claim 17 (Original): The method of claim 16 wherein the step function is a non-shorted step pulse.

Claim 18 (Original): The method of claim 16 wherein the pulse is generated and communicated to each probe.

Claim 19 (Original): The method of claim 16 wherein the impedance mismatch is ideal.

Claim 20 (Original): The method of claim 16 wherein the impedance mismatch is created by operatively placing a capacitor in the path of pulse.

Claim 21 (Original): The method of claim 16 wherein the impedance mismatch is created by crimping an electrical conduit for the pulse.

Claim 22 (Original): The method of claim 1 further comprising measuring moisture content and monitoring drying in a plurality of dryer bins.

Claim 23 (Original): The method of claim 1 wherein the moisture content is derived at successive times during drying.

Claim 24 (Original): The method of claim 23 wherein the successive times are spaced intervals of time.

Claim 25 (Original): The method of claim 1 wherein the moisture content is derived interiorly of the mass or collection of porous media.

Claim 26 (Original): The method of claim 25 wherein the moisture content is derived across a substantial portion of the porous media.

Claim 27 (Currently Amended): A method for monitoring moisture content of an agricultural product ~~such as grain or seed~~ wherein the agricultural product is grain or seed, whether or not on a carrier and the moisture content of the grain or seed is derived by compensating for moisture in the carrier, if any, during an artificial drying process comprising:

(a) placing the product to be dried into a relatively large drying bin;

(b) positioning an electrically conducting wave guide of known length in the product;

(c) sending an electromagnetic pulse through the wave guide;

(d) deriving amount of time for said pulse to move end to end through the wave guide by time domain reflectometry; ~~and~~

(e) deriving moisture content of the product around the wave guide from the time domain reflectometry derived time.; and

(f) utilizing the moisture content derived by time domain reflectometry in control of the drying process.

Claim 28 (Original): The method of claim 27 further comprising placing a plurality of wave guides of known length into the product.

Claim 29 (Cancelled).

Claim 30 (Currently Amended): The method of claim ~~29~~ 27 wherein the control of the drying process comprises utilizing measured moisture content derived by time domain reflectometry in the control of airflow and/or air temperature through the product.

Claim 31 (Cancelled).

Claim 32. (Currently Amended) An apparatus for monitoring artificial drying of an agricultural porous media ~~such as grain or seed~~ wherein the agricultural product is grain or seed, whether or not on a carrier and the moisture content of the grain or seed is derived by compensating for moisture in the carrier, if any, comprising;

(a) a relatively large drying chamber for holding a porous media to be dried;

(b) a time domain reflectometry wave guide adapted for insertion into a porous media in the drying chamber;

(c) a time domain reflectometry device;

(d) ~~an electrical connection between~~ the wave guide and the time domain reflectometry device adapted for electrical communication;

(e) the time domain reflectometry device adapted to derive moisture content of the porous media from time domain reflectometry signals which travel through the wave guide, and make derived moisture content available for use in monitoring or controlling the drying process;

(f) a dryer controller operatively connected to the time domain reflectometry device.

Claim 33 (Original): The apparatus of claim 32 wherein the porous media comprises ear corn.

Claim 34 (Original): The apparatus of claim 33 wherein the drying chamber is a bin at least several feet by several feet in size.

Claim 35 (Original): The apparatus of claim 32 wherein the wave guide comprises an electrically conducting rod of a certain length.

Claim 36 (Original): The apparatus of claim 35 wherein the wave guide comprises an array of electrically conducting rods spaced apart from one another and connected to a header.

Claim 37 (Original): The apparatus of claim 32 wherein the TDR device comprises a step voltage pulse generator and digital sampler, the step voltage generator connected by an electrical cable to the electrical connection, the digital sampler electrically connected to the electrical connection.

Claim 38 (Original): The apparatus of claim 32 further comprising a dryer controller operatively connected to the time domain reflectometry device, the dryer controller including a processor adapted to receive a signal from the TDR device and utilize it to generate instructions adapted for a drying system for controlling airflow and/or temperature to the bin.

Claim 39 (Original): The apparatus of claim 38 further comprising an interface between the wave guide and the TDR device, the interface comprising a multiplexer.

Claim 40 (Original): The apparatus of claim 32 further comprising a component to introduce an impedance mismatch prior to the wave guide.

Claim 41 (Original): The apparatus of claim 40 wherein the component to introduce an impedance mismatch comprises a capacitor.

Claim 42 (Original): The apparatus of claim 40 wherein the component to introduce an impedance mismatch is created by placing a crimp in the electrical connection at or very near its connection to the wave guide.

Claim 43 (Currently Amended): An apparatus to monitor moisture content of an agricultural product ~~such as grain or seed~~ wherein the agricultural product is grain or seed, whether or not on a carrier, and the moisture content of the grain or seed is derived by compensating for moisture in the carrier, if any, to assist in control of artificial drying of the product comprising:

(a) a dryer bin adapted to hold a relatively large amount of agricultural product;

(b) a TDR probe positioned in the bin;

(c) an electromagnetic energy source adapted to create an electromagnetic pulse to travel through the probe;

(d) an electromagnetic reflection sensor;

(e) an electrical interface between the probe and the energy source and the reflection sensor;

(f) an electromagnetic reflection analyzer electrically interfaced with the electromagnetic reflection sensor;

(g) so that time domain reflectometry information can be derived for the pulse relative to the probe

(h) a connection between the processor and a dryer controller so that artificial drying can be controlled by instructing the dryer controller as a function of moisture content readings.

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Claim 44 (Original): The apparatus of claim 43 wherein the probe comprises an elongated electrically conducting wave guide.

Claim 45 (Currently Amended): The apparatus of claim 44 further comprising a plurality of probes.

Claim 46 (Original): The apparatus of claim 43 wherein the electromagnetic energy source is a step voltage generator.

Claim 47 (Original): The apparatus of claim 43 wherein the electromagnetic reflection sensor is a digital sampler.

Claim 48 (Original): The apparatus of claim 43 wherein the electrical interface comprises a multiplexer.

Claim 49 (Original): The apparatus of claim 43 wherein the electromagnetic reflection analyzer is a processor.

Claim 50 (Original): The apparatus of claim 49 wherein the processor includes software for evaluating the output of the reflection sensor and deriving moisture content of the product surrounding each probe related to a point in time.

Claim 51 (Cancelled).

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Claim 52 (Original): The apparatus of claim 43 further comprising a plurality of probes for a plurality of dryer bins, each probe operatively connected to the electromagnetic source and reflection sensor, for monitoring moisture in a plurality of locations simultaneously or sequentially.

Claim ~~54~~ 53 (Currently Amended): The apparatus of claim 52 further comprising operatively connecting the reflection sensor to a processor having an interface with a control unit for controlling operation of a dryer.

Claim ~~55~~ 54 (Currently Amended): The apparatus of claim 53 wherein the probe comprises three electronically conducting members generally parallelly spaced apart.

Claim ~~56~~ 55 (Currently Amended): The apparatus of claim ~~55~~ 54 wherein ~~the~~ a middle ~~member~~ wave guide element is connected to the electromagnetic energy source and ~~the~~ outer ~~members~~ wave guide elements to ground.

Claim ~~57~~ 56 (Currently Amended): The apparatus of claim ~~55~~ 54 further comprising a plurality of ~~members~~ wave guide elements, generally parallel to one another, successive ~~members~~ wave guide elements alternating between connection to the electromagnetic energy source and ground respectively, except for ~~the~~ outer two ~~members~~ wave guide elements which are connected to ground.

Claim ~~58~~ 57 (Currently Amended): The apparatus of claim ~~54~~ 53 wherein the probe is in the range of 4 feet to 16 feet long.

Claim ~~59~~ 58. (Currently Amended): The apparatus of claim ~~54~~ 53 wherein the probe is comprised of tubes approximately 2 inches in diameter.

Claim ~~60~~ 59. (Currently Amended): The apparatus of claim ~~54~~ 53 wherein the probe extends substantially across the bin.

Claim ~~61~~ 60. (Currently Amended): The apparatus of claim ~~60~~ 59 further comprising supports to attach and hold the probe relative to the bin.

Claim ~~62~~ 61. (Currently Amended): A probe for use with a TDR system for monitoring artificial drying of an agriculture product ~~such as seed or grains~~wherein the agricultural product is grain or seed, whether or not on a carrier, and the moisture content of the grain or seed is derived by compensating for moisture in the carrier, if any, in a dryer bin or chamber of over 50 cubic feet in volume, comprising:

(a) an elongated electrically conductive member sized to extend a substantial distance into a material to be measured in the bin or chamber;

(b) a connection to an electrical conduit adapted for connection to a TDR device;

(c) an impedance mismatch component in the electrical conduit;

(d) a support connection adapted to connect the conductive member to supporting structure associated with the bin or chamber.

Claim ~~63~~ 62. (Currently Amended): The apparatus of claim ~~62~~ 61 wherein the electrically conductive ~~member~~ wave guide elements ~~comprises~~ comprise a wave guide array of three elongated electrically conductive ~~members~~ wave guide elements each the same length from 4 feet to 16 feet long adapted to be generally parallelly spaced apart in position in a bin or chamber, the center ~~member~~ wave guide element adapted to be in electrical communication with a fast rising stepped electromagnetic pulse via the conduit, the outer ~~members~~ wave guide elements adapted to be connected to ground.

Claim ~~64~~ 63 (Currently Amended): The apparatus of claim ~~63~~ 62 wherein each member is in the range of 4 to 16 feet long.